

Climate change may already impact majority of humanity: study

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Researchers found some 100,000 papers that potentially documented evidence of climate change's effects.

The effects of climate change could already be impacting 85 percent of the world's population, an analysis of tens of thousands of scientific

studies said Monday.

A team of researchers used machine learning to comb through vast troves of research published between 1951 and 2018 and found some 100,000 papers that potentially documented evidence of [climate change](#)'s effects on the Earth's systems.

"We have overwhelming evidence that climate change is affecting all continents, all systems," study author Max Callaghan told AFP in an interview.

He added there was a "huge amount of evidence" showing the ways in which these impacts are being felt.

The researchers taught a computer to identify climate-relevant studies, generating a list of papers on topics from disrupted butterfly migration to heat-related human deaths to forestry cover changes.

The studies only rarely established a direct link to [global warming](#)—so Callaghan and teams from the Mercator Research Institute and Climate Analytics, both in Berlin, took on the task themselves.

Using location data from the studies, they divided the globe into a grid and mapped where documented [climate impacts](#) matched climate-driven trends in temperature and precipitation.

For each grid cell they asked "is it getting hotter or colder or wetter or dryer outside of the bounds of natural variability?" said Callaghan.

Then, he said, they checked if this kind of heating matched expectations from climate models.

They found 80 percent of the globe—home to 85 percent of the world's

population, had generated impact studies that matched predictions for temperature and precipitation changes due to global warming.

Crucially, he said, research has disproportionately documented climate impacts in richer nations, with fewer studies in highly-vulnerable regions.

For example he said that trends in temperatures and rainfall in Africa could be linked to climate change.

"But we won't have many studies documenting the impacts of those trends, he said, calling it a "blind spot in our knowledge of climate impacts".

Machine learning

Climate-related research has grown exponentially in recent decades.

Between 1951 and 1990 "we have about 1,500 studies in total," Callaghan said, "Whereas in the five years or so since the last (UN) assessment report we have between 75,000 and 85,000 studies—a phenomenal increase."

Callaghan said the sheer volume of research has made it impossible to individually identify all the studies that reliably link observed impacts to manmade climate change.

"In the first UN climate assessment report a team of authors could simply read all of [climate](#) science," he said. "Now you'd need millions of authors."

The machine learning technique now offers a global picture that could help experts trying to synthesise huge numbers of studies, Callaghan

said, although he added that "it can never replace human analysis".

The study is published in *Nature Climate Change* .

More information: Max Callaghan et al, Machine-learning-based evidence and attribution mapping of 100,000 climate impact studies, *Nature Climate Change* (2021). [DOI: 10.1038/s41558-021-01168-6](https://doi.org/10.1038/s41558-021-01168-6)

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